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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of: : Mark Philip D'Evelyn et al.
Application No. : 09/683,658
Filed : January 31, 2002
Examiner : Jennifer A. Leung
Group Art Unit : 1764
Confirmation No. : 1463
Title : PRESSURE VESSEL

APPEAL BRIEF

(In compliance with 37 CFR § 41.37)

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In response to the Office Communication dated December 8, 2006, Appellant submits this Appeal Brief and the fee specified in 37 CFR § 41.20(b)(2) (\$500.00 for a large entity).

Real Party in Interest – 37 C.F.R. 41.37(c)(1)(i)

The General Electric Company is the real party in interest.

Related Appeals and Interferences – 37 C.F.R. 41.37(c)(1)(ii)

None aware of.

Status of Claims – 37 C.F.R. 41.37(c)(1)(iii)

On July 18, 2006 Appellant appealed from the final rejection of claims 104-106, 112, 130, 145-155. No claims stand withdrawn. No claims are allowed or objected to. Claim 1-103, 107-111, 113-129, 131-144 are cancelled. Claims 104-106, 112, 130, 145-155 are currently pending and the subject of this Appeal.

Status of Amendments – 37 C.F.R. 41.37(c)(1)(iv)

All amendments have been entered. Accordingly, claims 104-106, 112, 130, 145-155 are pending and the subject of Appeal, and there are no outstanding amendments.

Summary of Claimed Subject Matter – 37 C.F.R. 41.37(c)(1)(v)

The only pending independent claims are claims 104 and 146.

With reference to Fig. 1, independent claim 104 discloses an apparatus that includes a capsule 12 (see page 9, lines 13-32), a restraint 24 (see see page 9, lines 13-32), and an energy source 18 (see page 7, lines 20-26). The capsule 12 has an interior surface 52 defining a volume 54, and the capsule 12 can receive a material and a fluid in the capsule volume 54. It is noted that at this point in the claim, the inference to the material and to the fluid does not make them elements or limitations of the claim, however they are mentioned to provide a standard against which the functionality of the

capsule 12 may be measured. The fluid becomes supercritical at least at a determined temperature and a determined pressure (see page 18, lines 19-33). The capsule 12 both is sealable, and maintains a seal to the material and to the fluid while the capsule 12 is subject to the determined temperature and to the determined pressure.

The restraint 24 has an interior surface defining a chamber, and the chamber is configured to receive the capsule 12, and the restraint 24 resists a pressure exerted by the capsule against the restraint interior surface and to maintain the chamber at a substantially constant volume.

The energy source 18 supplies sufficient thermal energy to the capsule 12 so that the determined temperature is at least about 800 degrees Celsius. The fluid is responsive to the thermal energy both to become supercritical at the determined temperature and at the substantially constant volume in the chamber, and to increase the pressure in the volume 54 to at least the determined pressure. Again, it is noted that the fluid provides the frame of reference against which the positively claimed elements are measured.

With regard to claim 146, an apparatus 100 is provided that includes a capsule 12, a restraint 24, and an energy source 18. The capsule 12 has an interior surface 52 defining a volume 54, and the capsule 12 has disposed within the volume an amount of metal material and an amount of ammonia (see page 18, lines 19-33). This differs from claim 104 in that the contents of the capsule 12 are positively recited, and are claim elements. The capsule 12 both is sealable to maintain an internal pressure, and is functionally capable of maintaining a seal to the amount of ammonia while the capsule is subject to a determined temperature and to a pressure in a range of from about 5 kBar to about 80 kBar.

The restraint 24 has an interior surface defining a chamber that can receive the capsule 12. The restraint 24 resists a pressure exerted by the capsule 12 against the restraint interior surface and to maintain the chamber at about a constant volume (see page 11, 27-29). The restraint 24 does not provide an active pressure load radially inward toward the capsule 24 (see page 11, 27-33).

The energy source 18 supplies thermal energy to the capsule 12 such that the ammonia responds to the thermal energy at the constant volume in the chamber to

increase the pressure in the chamber and to become supercritical ammonia (see page 11, 27-33). The supercritical ammonia reacts with the metal material to form a metal nitride composition (see page 16, lines 17-24).

Appellant notes that there is no “means for” or “step plus function” language under 35 U.S.C. §112, paragraph six in the independent claim.

Grounds of Rejection to be Reviewed on Appeal – 37 C.F.R. 41.37(c)(1)(vi)

1. Whether claims 150-152 were properly rejected under 35 USC § 112 as being indefinite.

2. Whether claims 104-106, 112, 130 and 145 and 154 were properly rejected under 35 USC § 102 as being anticipated by Wilson et al. (US 3,473,935).

3. Whether claim 106 was properly rejected under 35 USC § 103 as being unpatentable over Wilson et al. in view of Hall et al. (US 2,947,610).

4. Whether claims 146-153 were properly rejected under 35 USC § 103 as being unpatentable over Wilson et al. in view of Flanigen (US 3,567,643).

Argument – 37 C.F.R. 41.37(c)(1)(vii)

The Examiner has erred in fact, and an error in fact is an error in law. As discussed in detail below, the Examiner has improperly rejected the pending claims as indefinite, or as obvious over the cited references. Accordingly, the Appellant respectfully requests withdrawal of these rejections of the claims. The rejections are discussed in the order addressed by the Examiner in the previous Office Action.

1. Claims 150-152 are not indefinite under 35 USC § 112.

Claims 150 - 152 were rejected as being indefinite under 35 USC § 112. It was unclear to the Examiner “as to the structural limitation ...because the ‘metal nitride composition’, the ‘single crystal metal nitride composition’ and the aluminum nitride’ are products formed by the apparatus, and are therefore not considered to be part of the apparatus”. Appellant responds that in the same way that a bread mixer differs from a

cement mixer based on a reference to the material produced, so to does one apparatus capable of processing one type of material differ from another apparatus capable of processing another type of material – based at least in part on a reference to the material produced thereby. Appellant grants more detail may be needed, but the reference to the material itself is neither indefinite nor is it unclear. If the parent claim is patentable, than the further characterization, however slight, that excludes some apparatuses and includes others within the scope of the parent claim should be sufficient to overcome a rejection under 35 USC § 112.

2. Claims 104-106, 112, 130 and 145 and 154 are not anticipated by Wilson et al. (US 3,473,935).

With regard to the rejection under 35 USC § 102(b) as being anticipated by Wilson et al., Appellant submits that the apparatus shown or disclosed differs from the invention as defined at least in independent claims 104. Ignored are the functional recitations of “to maintain the chamber at a substantially constant volume” and “to maintain the chamber at about a constant volume”.

The core 16 indicated in the Office Action as anticipating the restraint is not bounded on at least two sides as shown in Fig. 1. The top and the bottom of the core 16 of Wilson et al are open. The core 16 of Wilson et al. provides, at best, two-dimensional control, and cannot provide three-dimensional control. “Volume” is a three-dimensional unit. A prior art element having both the function and structure of the restraint as defined in the independent claim is not shown. Accordingly, Appellant expects that a rejection based on an accumulation of prior art elements (the core 16 plus the two press pistons 23 and 24, or the core 16 plus the rings 11-15) would similarly not anticipate the independent claims. In summary, there is no corresponding structure in the cited art that has the structure and performs the function of at least one of the elements in each of the independent claims.

While supercritical fluid may not be a positive element recitation in claim 104, the term does qualify as functional language modifying an attribute of a positively recited claim element. As functional language the term does have patentable weight if it sets definite boundaries on the patent protection sought. *In re Barr*, 444 F.2d 588, 170 USPQ

33 (CCPA 1971). Particularly, the term functionally qualifies a structural element that is positively set forth in clear language. A functional limitation defines something by what it can do, rather than by what it is (e.g., as evidenced by its specific structure). A functional limitation must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art in the context in which it is used. A functional limitation may be used in association with an element to define a particular capability or purpose that is served by the recited element. An analogy may be had with reference to waterproof boots – the fact that there is no water currently in contact with those boots does not negate the substantive, functional qualifier of “waterproof”.

The functional language used herein sets definite boundaries on the patent protection sought. *In re Barr*, 444 F.2d 588, 170 USPQ 33 (CCPA 1971). Further, the functional language precisely defines present structural attributes of the claimed element. *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976). By refusing to consider all of the terms and elements of the claims, Appellant submits that there is clear error in the rejections listed in the Office Action.

Claim 105 states “the restraint is operable to counterbalance pressure in the capsule”. Wilson et al. discloses the core 16 is a tungsten carbide core (column 3, line 12). In lines 15-20 (still column 3), the bores, and counterbores cooperate with the pistons “...to impose pressure on the sample...” Appellant has gone to great lengths to indicate that actively imposing pressure differs from providing a counterbalancing pressure. The Office Action would vitiate that distinction.

Claims 112 and 130 depend from an allowable claim, and are therefore also allowable. Claim 130 defines functionally the quality, character or attribute of the restraint that is measurable as a pressure response. The “pressure response” is an inherent property of the restraint. For example, if an exemplary non-inventive capsule was placed in a moving press and did not self-pressurize - then for every percent increase in the dynamic press force there would be a corresponding non-linear increase in the capsule pressure. By contrast, if a self-pressurizing capsule were placed in a dynamic press then an increase in force from the dynamic press would increase the pressure both by direct

pressure from the press and from the pressure from the self-pressurizing capsule. By way of further contrast, if a self-pressuring capsule were placed in a static restraint subject to, for example, thermal expansion then the percent increase in pressure would differ relative to the other two postulated scenarios (all assume an increase in temperature or reference operation condition). In summation, the pressure response (or percentage ratios) differ based at least on the source of the pressure. As such, the claim limitation indicates where the pressure originates, and is a legitimate element of the claimed apparatus. It is not a variable of an intended process.

Claim 145 depends from an allowable claim and defines a capsule that can exert an internal a pressure of greater than about 60 kBar. Pressure limits for capsules or cells in Wilson et al. are disclosed to be up to 60 kBars (col. 2, line 58, and col. 3, line 44, respectively). For at least claim 145, Wilson et al. does not disclose or enable a pressure capability approaching the claim definition. Without disclosure or reasonable suggestion of the claim elements, there can be no anticipation.

3. Claim 106 is patentable over Wilson et al. in view of Hall et al. (US 2,947,610).

Claim 106 was rejected under 35 USC § 103 over Wilson et al in view of Hall et al. Claim 106 recites a “heating system that includes the energy source and a temperature sensor, wherein the temperature sensor is disposed proximate to the capsule and is operable to sense a temperature of the capsule”. The Office Action admits that Wilson et al. “is silent as to the control system being operable to provide a closed loop temperature control of the heating system, in response to a signal generated by a temperature sensor disposed proximate to the capsule”. The Office Action continues, “it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a temperature sensor and to configure a closed loop temperature control scheme for the control system in the apparatus of Wilson et al. on the basis of suitability for intended use”.

However, Appellant submits that this is not the standard for a *prima facie* case of obviousness. That a cited reference *may be* modified is not the standard, rather a reason for the combination or modification must be given. Clearly, Wilson et al did not believe

a sensor was necessary, otherwise they would have disclosed one. Similarly, Hall et al. does not disclose other elements of the claimed invention because that was not the intent or understanding of Hall et al. For the cited art to be combined, without the benefit of impermissible hindsight reconstruction, there must be some reason or motivation provided beyond mere “because it is well known in the art to connect a control system with a temperature sensor to enable precise, closed loop control of the reaction temperature”. The closed loop control is disclosed in claim 106, and not disclosed in Wilson et al. Hall et al. provides no insight as to whether a control system as disclosed therein would be a boon to the invention of Wilson et al., or even if the combination would be basically functional to carry out the reaction of Wilson et al. who did not appear to need the modification the Office Action suggests.

In addition, the Office Action states that the replacement of manual means with automated means is obvious. That does not appear to be in dispute. Claim 106 includes a sensor, and Wilson et al. does not disclose such a structural or functional element. The Office Action attempts cure this deficiency by combining elements of Wilson et al. and Hall et al. The result of the combination is, unfortunately, a combination of a reaction that does not appear to need a sensor, and likely is workable in large temperature ranges, with a reaction that uses a sensor. Appellant submits that an explanation would be useful as to why one of ordinary skill in the art would take a simple and functional apparatus as shown in Wilson et al. and start adding components and control systems to increase the complexity and cost. As no such explanation has been proffered, Appellant submits that a *prima facie* case of obviousness has not been made, the rejection should be withdrawn, and a notice to that effect is respectfully requested.

4. Claims 146-153 are patentable over Wilson et al. in view of Flanigen (US 3,567,643).

Claim 146 is rejected under 35 USC § 103 as being unpatentable over Wilson et al in view of Flanigen et al. Claim 146 defines a structure capable of maintaining a seal at a pressure range of from 5 kBar (about 75,000 psi) to about 80 kBar. Flanigen et al. shows an example of not more than 20,000 psi as indicated in the Office Action. It is not reasonable for one of ordinary skill in the art to expect that a seal designed for use

at a low pressure would be a suitable replacement for a situation that requires a minimum of about 3 times more pressure. It is not obvious what seal or seal mechanism would be sufficient for the different and extreme pressures, such as those defined in claim 146.

In summary of the arguments set forth, the Examiner errs both in fact and in law. The pending claims are not obvious in view of the cited art references (alone or in combination). The primary reference for all of the rejections does not show what it is purported to show, namely a substrate having the properties as defined in claim 1. The addition of any of the other cited reference similarly does not show the claimed substrate. Finally, the combination of any of the references does not disclose, teach or reasonably suggest the invention as defined in at least claim 1.

Claims Appendix - – 37 C.F.R. 41.37(c)(1)(viii)

Appendix I containing a listing of the claims as pending in this Appeal is attached following the signature page of this Brief.

Evidence Appendix – 37 C.F.R. 41.37(c)(1)(ix)

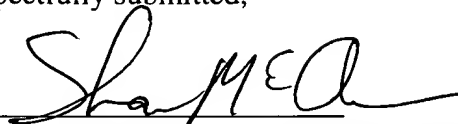
An Appendix II containing a copy of the references cited in the arguments presented here is attached following the Claim Appendix of this Brief.

Related Proceedings Appendix – 37 C.F.R. 41.37(c)(1)(x)

There are no related proceedings to this Appeal. An Appendix III stating that there are no related proceedings under 37 C.F.R. 41.37(c)(1)(x) is provided.

Appellant respectfully submits that the claims 104-106, 112, 130, and 145-155 define allowable subject matter over the cited art, and requests that the rejections to Claims 104-106, 112, 130, and 145-155 be withdrawn.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Shawn A. McClintic", written over a horizontal line.

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15 Dec 2006

Date

Claims Appendix I under 37 C.F.R. 41.37(c)(1)(viii)

Following are a listing of claims as currently pending in the Application that is the subject of this Appeal.

Listing of Claims:

Claims 1-103 (cancelled)

Claim 104. (Previously presented) An apparatus, comprising:

a capsule having an interior surface defining a volume, and the capsule is configured to receive a material and a fluid in the capsule volume, the capsule both is sealable, and is operable to maintain a seal while the capsule is subject to a determined temperature and to a determined pressure, and the fluid is operable to become supercritical at least at the determined temperature and the determined pressure;

a restraint having an interior surface defining a chamber, and the chamber is configured to receive the capsule, and the restraint is responsive to resist a pressure exerted by the capsule against the restraint interior surface and to maintain the chamber at a substantially constant volume; and

an energy source operable to supply sufficient thermal energy to the capsule so that the determined temperature is at least about 800 degrees Celsius, wherein the fluid is responsive to the thermal energy both to become supercritical at the determined temperature and at the substantially constant volume in the chamber, and to increase the pressure in the volume to at least the determined pressure.

Claim 105. (Previously presented) The apparatus as defined in claim 104, wherein the restraint is operable to counterbalance pressure in the capsule generated by the fluid in response to thermal energy, and the restraint is immobile relative to the capsule while counterbalancing the capsule pressure.

Claim 106. (Previously presented) The apparatus as defined in claim 104, further comprising a heating system that includes the energy source and a temperature sensor, wherein the temperature sensor is disposed proximate to the capsule and is operable to sense a temperature of the capsule.

Claims 107. – 111. (Cancelled)

Claim 112. (Previously presented) The apparatus of claim 104, further comprising a clamp in contact with the restraint, wherein the clamp is operable to reduce a pressure load on at least a portion of the restraint, and the pressure load can cause a longitudinal stress or an axial stress or both a longitudinal and an axial stress on the restraint portion.

Claims 113. – 129. (Cancelled)

Claim 130. (Previously presented) The apparatus as defined in claim 104, wherein the restraint is operable to transmit pressure to the capsule such that the transmitted pressure to the capsule is measurable as a pressure response of the restraint and is less than about 0.2.

Claim 131. – 144. (Cancelled)

Claim 145. (Previously presented) The apparatus as defined in claim 104, further comprising the fluid and the material, and wherein the fluid is sufficiently responsive to thermal energy to pressurize the capsule to an internal pressure in a range of greater than about 60 kbar, and the capsule and the restraint are cooperatively configured to maintain the seal at the internal pressure and at the corresponding temperature.

Claim 146. (Previously presented) An apparatus, comprising:

a capsule having an interior surface defining a volume, the capsule having disposed within the volume an amount of metal material and an amount of ammonia, the capsule both is sealable to maintain an internal pressure, and is functionally capable of maintaining a seal to the amount of ammonia while the capsule is subject to a determined temperature and to a pressure in a range of from about 5 kBar to about 80 kBar;

a restraint having an interior surface defining a chamber that is configured to receive the capsule, and the restraint is responsive to resist a pressure exerted by the capsule against the restraint interior surface and to maintain the chamber at about a constant volume, and wherein the restraint is not operable to provide an active pressure load radially inward toward the capsule; and

an energy source operable to supply thermal energy to the capsule, such that the ammonia responds to the thermal energy at the constant volume in the chamber to increase the pressure in the chamber and to become supercritical ammonia, wherein the supercritical ammonia reacts with the metal material to form a metal nitride composition.

Claim 147. (Previously presented) The apparatus as defined in claim 146, wherein the metal material comprises aluminum.

Claim 148. (Previously presented) The apparatus as defined in claim 147, wherein the restraint is capable of resisting the internal pressure, and the internal pressure is sufficiently high to form aluminum nitride.

Claim 149. (Previously presented) The apparatus as defined in claim 148, wherein the restraint is capable of resisting the pressure sufficient to form aluminum nitride at a temperature sufficient to form aluminum nitride.

Claim 150. (Previously presented) The apparatus as defined in claim 146, wherein, subsequent to use, the capsule has disposed in the volume the metal nitride composition.

Claim 151. (Previously presented) The apparatus as defined in claim 150, wherein the capsule has disposed in the volume a single crystal metal nitride composition.

Claim 152. (Previously presented) The apparatus as defined in claim 150, wherein the capsule has disposed in the volume aluminum nitride.

Claim 153. (Previously presented) The apparatus as defined in claim 146, wherein the capsule is functionally capable of maintaining the seal to the amount of ammonia while the capsule is subject to the determined temperature and to the pressure in a range of from about 5 kBar to about 60 kBar.

Claim 154. (Previously presented) The apparatus as defined in claim 112, wherein the clamp is operable to reduce the pressure load, and the pressure load can cause a longitudinal stress or both a longitudinal and an axial stress on the restraint portion.

Claim 155. (Previously presented) The apparatus as defined in claim 104, further comprising the material and the fluid, wherein the material comprises aluminum, and the fluid comprises ammonia.

Evidence Appendix II under 37 C.F.R. 41.37(c)(1)(ix)

The following pages include the references referred to in the argument and body of this Appeal Brief.

Included are:

Flanigen (US 3,567,643)

Wilson et al. (US 3,473,935)

Hall et al. (US 2,947,610)

Related Proceedings Appendix III under 37 C.F.R. 41.37(c)(1)(x)

There are no related proceedings to this Appeal.